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# TECHNICAL REPORT

## Analysis of Financial Support to the Surviving Spouses and Children of Casualties in the Iraq and Afghanistan Wars

Amalia R. Miller, Paul Heaton, David S. Loughran

Prepared for the Office of the Secretary of Defense

Approved for public release; distribution unlimited



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## Preface

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Federal law mandates that every four years the President assess the military compensation system. The eleventh such review, known as the 11th Quadrennial Review of Military Compensation (QRMC), focuses on four broad areas: (1) combat compensation, (2) reserve component compensation, (3) compensation for wounded warriors and surviving spouses, and (4) pay incentives for critical career fields. The research documented in this report addresses compensation for surviving spouses.

Since September 11, 2001, the United States has deployed more than 1.7 million service members to support military operations in Iraq and Afghanistan. Official records show that more than 6,000 of those service members were killed during their deployment or died as a result of injuries sustained during deployment. This study examines how the death of service members during Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF) has affected the subsequent labor market earnings of their surviving spouses and the extent to which survivor benefits provided by the Department of Defense, the Department of Veterans Affairs, and the Social Security Administration have compensated for lost household earnings. The report should be of interest to policymakers and manpower analysts concerned with the effects of combat deaths on the lives of service members' families.

This research was sponsored by the 11th QRMC and conducted within the Forces and Resources Policy Center of the RAND National Defense Research Institute, a federally funded research and development center sponsored by the Office of the Secretary of Defense, the Joint Staff, the Unified Combatant Commands, the Navy, the Marine Corps, the defense agencies, and the defense Intelligence Community.

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## Summary

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Military operations lasting more than a decade in Iraq and Afghanistan have focused national interest on meeting the needs of military families, especially families of service members who were injured or killed in combat. The President directed the Secretary of Defense, as part of the 11th Quadrennial Review of Military Compensation (QRMC), to review “compensation benefits available to wounded warriors, caregivers, and survivors of those fallen service members” (Obama, 2009). The research documented in this report was undertaken to assist the 11th QRMC in responding to that directive by providing the first comprehensive, quantitative assessment of the impact of combat deaths on household labor market outcomes. It also assesses the extent to which payments that surviving spouses and children receive from the Department of Defense (DoD), the Department of Veterans Affairs (VA), and the Social Security Administration (SSA) compensate for earnings losses attributable to combat deaths.

## Study Design

This study measures the impact of combat deaths on the financial well-being of surviving spouses and children of service members deployed to Iraq or Afghanistan between June 2003 and December 2006. Longitudinal, administrative data from military personnel records, casualty records, and annual Social Security earnings databases were linked together using Social Security numbers of service members and their spouses. This information was combined with data on payments made to surviving spouses and children from DoD, the VA, and SSA to estimate the impact of combat death on household income and earnings and to assess the degree to which cash benefits from the federal government compensate surviving household members for their financial losses.

Among the 347,078 married service members who deployed between 2003 and 2006, the casualty records show that 1,184 (0.3 percent) were killed in combat. We compared the labor market earnings of households experiencing a combat death in the years following deployment with those of deployed but uninjured service member households. Because the risk of combat death is likely to be correlated with characteristics of service members that could themselves affect household labor market outcomes (e.g., pay grade, military occupation, risk-taking behavior), we controlled for a rich array of individual-level characteristics, including labor market outcomes for both service members and spouses prior to deployment. This approach includes controls for potentially unobserved factors that are unique to specific households and fixed over time and increases the likelihood that the results capture the causal effect of combat death on household earnings. Nevertheless, these controls are imperfect, and the patterns doc-

umented here could in theory also partially reflect other uncontrolled characteristics of households, which would undermine such a causal interpretation.

This research does not address the difficult normative question of whether the replacement rates reported here are appropriate. The appropriate level of benefits depends in large part on the overarching goals and constraints associated with a particular compensation system. Heaton et al. (2012), for example, argue that the structure and amount of compensation provided to families of combat casualties should be adjusted to reflect policymaker preferences regarding the desirability of fulfilling goals such as compensating for economic loss, ensuring a stable inflow of new personnel into the military, and appropriately recognizing the sacrifice of those who died serving the country. While normative questions surrounding benefit adequacy are important, resolving them lies beyond the scope of the present inquiry.

## **Labor Market Earnings Effects**

We find that household labor market earnings decline substantially in the years following the combat death of a member of the household. The estimated drop in annual household earnings over the first four years following a fatality ranges from \$63,000 to \$68,000 for members of the active components (ACs) and from \$59,000 to \$65,000 for members of the reserve components (RCs). There appears to be little change in the magnitude of the effect over these years. The main driver of the earnings drop is, naturally, the loss of the service member's own earnings. However, declines in spousal earnings are also significant over the first four years, ranging from \$4,600 to \$5,500 for AC spouses and from \$7,700 to \$8,800 for RC spouses.

## **Estimated Replacement Rates**

Surviving spouses and children can potentially receive recurring monthly benefits from a number of federal sources, including DoD, the VA, and SSA. In addition, family members are eligible to receive one-time payments from the Servicemembers' Group Life Insurance (SGLI) program, the DoD Death Gratuity, and Combat-Zone Tax Forgiveness. Many of these survivor payments are tax-free, which we account for in our analysis.

On average, recurring benefits from these sources offset more than two-thirds of the estimated losses in household labor market earnings attributable to combat death over the first four years following the fatality. Excluding lump-sum payments, the estimated effect of a combat death on total household income—the sum of service member and spousal labor market earnings plus recurring survivor compensation—in the fourth year following deployment is negative for both RC and AC members but substantially smaller than the estimated effect on earnings. The post-compensation income loss in year 4 for AC members averages about \$20,000, or about 30 percent of the total earnings loss in that year. For RC members, the post-compensation income loss is \$14,000, about 22 percent of the total drop in household earnings.

The household-income replacement rate in year 4—defined as the ratio between actual income (including all recurring forms of federal survivor benefits—and expected income had the service member returned from deployment uninjured is 78 percent for the median surviving-spouse household of an AC member and 88 percent for that of an RC member.

Taking into account the value of the lump-sum payments (mainly from the Death Gratuity and SGLI) spread over a 20-year horizon increases the average replacement rates to 116 percent and 122 percent for the families of AC and RC members, respectively. Within each component, the household-income replacement rates are lowest for service members who had no dependent children at the time of their deaths and are highest for households with more than two dependent children.

The household-income replacement rate includes the value of the surviving spouse's earnings (and earnings loss), as well as the predicted income growth the service member would have experienced had he or she not been injured. An alternative measure of the generosity of survivor benefits is the own-income replacement rate, i.e., the ratio of survivor benefits to the service member's own pre-deployment income. The median individual replacement rates in our sample are 68 percent and 72 percent for AC and RC members, respectively, when we consider only recurring benefits, and 170 percent and 184 percent when we include lump-sum payments amortized over 20 years. The comparison relative to the service member's own pre-deployment income is similar to the basis for compensation used in other recurring-survivor-benefit programs, where benefits are adjusted for inflation but not for predicted income growth, and where spousal income is ignored. For example, family members of DoD civilian employees who die while performing their official duties are compensated based on the provisions of the Federal Employee Compensation Act, using a compensation formula based on prior earnings. The key finding of substantial income replacement (more than two-thirds) from recurring payments and complete income replacement from recurring plus lump-sum payments is consistent across the different replacement-rate measures.



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## Abbreviations

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AC	active component
AFQT	Armed Forces Qualification Test
CPI-U	Consumer Price Index for all urban consumers
CPS	Current Population Survey
DEERS	Defense Enrollment Eligibility Reporting System
DIC	Dependency and Indemnity Compensation
DMDC	Defense Manpower Data Center
DoD	Department of Defense
FECA	Federal Employee Compensation Act
FEGLI	Federal Employees Group Life Insurance
FICA	Federal Insurance Contributions Act
MBP	monthly benefit paid
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
PDHA	Post-Deployment Health Assessment, DD Form 2796
QRMC	Quadrennial Review of Military Compensation
RC	reserve component
SBP	Survivor Benefit Plan
SGLI	Servicemembers' Group Life Insurance
SSA	Social Security Administration
SSIA	Special Survivor Indemnity Allowance
SSN	Social Security number
TSGLI	Traumatic Injury Protection under Servicemembers' Group Life Insurance
VA	Department of Veterans Affairs



## Introduction

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Military operations in Iraq and Afghanistan lasting more than a decade have focused national attention on meeting the needs of military families, especially families of service members who were injured or killed in combat. According to official casualty records, between October 7, 2001, and March 5, 2012, 6,370 members of the U.S. military were killed during their deployments to Iraq or Afghanistan or died as a result of injuries sustained during those deployments (Defense Casualty Analysis System, undated).

Little is known about the economic impact of combat deaths on surviving household members. This study provides some of the first empirical evidence on this issue. The analysis includes married active component (AC) and reserve component (RC) service members whose deployments ended between 2003 and 2006 and examines their and their spouses' subsequent labor market and other compensation through 2010. By comparing earnings trajectories of uninjured households with those of households that experience a combat death, we can quantify the financial impact of combat-related deaths on surviving spouses and children. We first estimate the impact of a service member's death on household earnings. Next, we measure the extent to which survivor benefits and compensation from various federal government sources provide financial replacement for lost earnings. The study does not attempt to quantify the non-financial losses experienced by spouses and children or the non-financial types of support that may be available to them.

Similar to this report, a 2007 report assessed the financial status of military widows, considering both spousal earnings and compensation from the Department of Defense (DoD) and the Department of Veterans Affairs (VA), including the tax advantage from such payments (Christensen et al., 2007). However, that study differs from the present study in several ways. First, Christensen et al. used data from the Current Population Survey (CPS) to compare different groups of widows (military and civilian), whereas we estimate the impact of combat deaths relative to outcomes for spouses of service members who return from their deployments without injuries. The Christensen et al. study was also a cross-sectional analysis that compared levels of income, rather than changes in income following a service member's death. Many widows in that study were observed years or decades after their spouse's death. Unlike the present analysis, it was not focused on combat-related deaths; the population was older, and the deaths were mainly non-combat-related.

This report is organized as follows. Chapter Two describes the data we used to define our sample and measure key variables, including combat deaths, labor market earnings, and survivor compensation, and presents descriptive statistics related to these variables. Chapter Three describes our empirical approach. Chapter Four reports the estimated effects of combat

death on labor market earnings and total household income, including survivor compensation. Chapter Five discusses the fraction of earnings losses that are replaced by existing survivor compensation mechanisms, and Chapter Six presents our conclusions.

## Data Used in the Study

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This study draws on administrative data on combat-related injury and death, labor market earnings, and disability and survivorship compensation obtained from DoD, the VA, and the Social Security Administration (SSA). This chapter describes how we used those data to construct our analysis sample and key measures of injury and earnings.

### Sample Definition

Our initial sample consists of more than 700,000 AC and RC members deployed to Afghanistan and Iraq who completed the Post-Deployment Health Assessment (PDHA) DD Form 2796 or appear in the Defense Manpower Data Center's (DMDC's) Casualty File between June 1, 2003, and December 31, 2006.<sup>1</sup>

Since 2003, all service members deployed outside of the continental United States to a land-based location with no fixed U.S. medical-treatment facility for 30 or more continuous days have been required to complete the PDHA within five days of the end of deployment.<sup>2</sup> As stated on DD Form 2796, the principal purpose of the PDHA is "to assess your state of health after deployment outside the United States in support of military operations and to assist military healthcare providers in identifying and providing present and future medical care to you." The PDHA records information about current physical and mental health as reported by the service member and documents concerns regarding environmental exposures.

The DMDC Casualty File is the source of official statistics on U.S. injuries sustained in support of Operation Enduring Freedom and Operation Iraqi Freedom (OEF/OIF). Any service member whose regular duty assignment is disrupted as a result of an injury sustained during hostile action is recorded in the Casualty File, along with information about the nature of the injury, including the date it was sustained. Many of the individuals in the Casualty File do not complete a PDHA because the seriousness of their injuries obviates the need for such an assessment.<sup>3</sup>

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<sup>1</sup> The sample includes service members reporting a deployment location of Kuwait or Qatar, as we assume that they were in fact deployed to Iraq and Afghanistan during at least part of their deployment. Most deployments to these areas in our data occur in 2003 and probably reflect the pre-Iraq-invasion buildup of military forces.

<sup>2</sup> See U.S. Department of Defense, 2002.

<sup>3</sup> It is likely that some deployed service members fail to complete the PDHA for reasons other than serious injury. We have no cause to believe, however, that this incomplete coverage biases the results reported here.

For each service member in our sample, we selected the latest deployment that ended before January 1, 2007. Beginning and end dates of deployment were obtained from self-reports in the PDHA or, for those who appear in the Casualty File but not in the PDHA, from DMDC's Global War on Terror Contingency File.<sup>4</sup>

## Demographic Covariates and Spouses

Data on age, gender, component, race/ethnicity, pay grade, education, score on the Armed Forces Qualification Test (AFQT),<sup>5</sup> military occupational specialty, and state of residence were obtained from DMDC's Work Experience File and the Defense Enrollment Eligibility Reporting System (DEERS). The sample is restricted to service member households for which we identified a spouse in the year before deployment,<sup>6</sup> and DEERS data enabled us to identify which service members were married in the year prior to deployment and the Social Security numbers (SSNs) of their spouses. We identified 224,977 spouses of AC members and 122,101 spouses of RC members.

## Fatalities and Injuries

We used data from the PDHA and the Casualty File to count fatalities and injuries in our sample. Medical professionals at a field hospital or other medical-treatment facility categorize service members who appear in the Casualty File as having a non-serious (non-life-altering), serious (life-altering), or very serious (life-threatening) combat injury. Individuals who died as a result of their injuries (either immediately or after some time) are counted as fatalities. Our sample of married service members contained 893 combat-related deaths in the ACs and 291 in the RCs. Table 2.1 lists the numbers of combat deaths, by component and year.

For individuals who do not appear in the Casualty File, we used data on injuries referred for follow-up care, along with their own assessments of whether their health changed for the worse while deployed. Health conditions were categorized as follows:

- No injury: was not referred for follow-up care and did not state health worsened during deployment
- Health worsened: stated health worsened during deployment but was not referred for follow-up care<sup>7</sup>
- Referred: stated health worsened during deployment and injury was referred for follow-up care.

<sup>4</sup> The Global War on Terror Contingency File uses data provided by the services and military pay data to determine dates of deployment. We could have used this source to define our sample, but we chose to use the PDHA instead because of the health data recorded on it.

<sup>5</sup> AFQT scores are available only for enlisted personnel.

<sup>6</sup> For this analysis, households are defined consistently over time based on the identities of the spouses in the pre-deployment year, regardless of their actual marital status in future years. Thus, we do not consider the role of post-deployment marital dissolution, a topic that has been examined by other researchers (e.g., Karney and Crown, 2007).

<sup>7</sup> The specific question on the PDHA is, Did your health change during this deployment? Respondents could choose "Health stayed about the same or got better" or "Health got worse."

**Table 2.1**  
**Number of Combat Fatalities Among Married**  
**Service Members, by Year and Component**

Year	Combat Fatalities	
	AC	RC
2003	31	24
2004	322	89
2005	246	125
2006	294	53
Total	893	291

Our sample includes service member households in all of the injury groups, including fatalities and uninjured. We estimated separate effects for each type of injury and found that our estimates were similar to those reported in Heaton, Loughran, and Miller (forthcoming). Those results are not reported here, however, because this analysis concerns only combat deaths. Nevertheless, the fact that we controlled for injuries is important for the interpretation of the results. In all cases, the effects of combat death are calculated relative to the benchmark case, in which no injury was recorded at the end of deployment.

## Labor Market Earnings

In this study, labor market earnings comprise cash compensation received from DoD and civilian employers. Earnings data come from SSA and DMDC. SSA records in its Master Earnings File earnings from all sources subject to Medicare taxes, including household employers and the self-employed.<sup>8</sup> These earnings data are of very high quality and have been used in many empirical studies, including a number of studies related to the labor market outcomes of veterans (e.g., Angrist, 1990, 1998; Christensen, 2007; Loughran, Klerman, and Martin, 2006; EconSys, 2008; Loughran et al., 2011).

Not included in SSA earnings records are military allowances—e.g., basic allowance for subsistence, basic allowance for housing, family separation allowance, and bonuses, which are not subject to Medicare taxes. We added these quantities to SSA earnings, using individual-level pay records contained in DMDC's Active and Reserve Duty Pay Files. We obtained annual earnings data for 1995 to 2010 for 97 percent of our sample.<sup>9</sup> All earnings figures are deflated to 2010 dollars, using the Consumer Price Index for all urban consumers (CPI-U).

Average household earnings amounts are shown in Table 2.2, by component, for households in which the service member returned from deployment uninjured (the baseline group) and households in which the service member died from a combat injury sustained during

<sup>8</sup> See Social Security Online (2011) for a list of employment categories that are exempt from Medicare taxes. Unlike Social Security earnings, Medicare earnings are not capped at the Social Security taxable limit.

<sup>9</sup> Virtually all service members should appear in the SSA data, since basic pay is subject to Medicare tax. Match rates below 100 percent, therefore, are likely due to discrepancies in the names, SSNs, and dates of birth used to match service members to SSA records.



**Table 2.2**  
**Summary Household Statistics, by Component, for Families of Uninjured Service Members and Those with Fatalities**

Item	AC		RC	
	Uninjured	Fatalities	Uninjured	Fatalities
Pre-deployment annual earnings (constant 2010 dollars)				
Service member	53,713	50,405	53,925	48,137
Spouse	11,040	9,338	20,509	18,414
Household earnings	64,753	59,743	74,434	66,552
Post-deployment household earnings (constant 2010 dollars)				
Year 1	75,905	6,527	79,899	11,409
Year 2	79,121	6,537	83,421	11,322
Year 3	80,381	7,427	86,031	11,530
Year 4	81,931	7,899	86,911	11,805
Post-deployment spousal earnings (constant 2010 dollars)				
Year 1	12,484	6,076	21,096	11,397
Year 2	13,705	6,537	21,930	11,322
Year 3	14,674	7,427	22,422	11,530
Year 4	15,161	7,899	22,400	11,805
Demographics				
Age	30	28	36	34
Male	0.94	1.00	0.95	0.99
White	0.71	0.76	0.75	0.73
Black	0.18	0.11	0.12	0.09
Hispanic	0.10	0.13	0.08	0.05
Married in pre-deployment year	1.00	1.00	1.00	1.00
No high school diploma	0.07	0.10	0.12	0.11
High school diploma	0.63	0.68	0.43	0.54
Some college	0.11	0.08	0.21	0.15
Bachelor's degree	0.13	0.12	0.17	0.15
Graduate degree	0.06	0.03	0.07	0.04
AFQT score	58	57	58	61
Military service				
Army	0.62	0.75	0.77	0.89
Air Force	0.24	0.02	0.15	0.00
Marine Corps	0.10	0.20	0.03	0.07
Navy	0.04	0.02	0.05	0.04
Pay grade: junior enlisted	0.34	0.40	0.26	0.32
Pay grade: senior enlisted	0.48	0.44	0.55	0.56
Pay grade: warrant officer	0.12	0.09	0.12	0.06

Table 2.2—Continued

Item	AC		RC	
	Uninjured	Fatalities	Uninjured	Fatalities
Pay grade: junior officer	0.02	0.01	0.04	0.02
Pay grade: senior officer	0.02	0.03	0.02	0.02
Pay grade missing	0.01	0.03	0.01	0.02
Pre-deployment health				
Self-reported health: excellent	0.28	0.30	0.22	0.24
Self-reported health: very good	0.30	0.29	0.34	0.33
Self-reported health: good	0.15	0.16	0.18	0.17
Self-reported health: fair	0.01	0.02	0.01	0.01
Self-reported health: poor	0.00	0.00	0.00	0.00
Sought mental health counseling	0.03	0.03	0.02	0.02
Have a medical problem	0.09	0.10	0.10	0.10
Currently on light duty	0.07	0.06	0.06	0.05

deployment. In the year before deployment, household income was higher for service members who were not injured during their deployments, and the same was true for their spouses. Married service members in the ACs and RCs have similar amounts of total pre-deployment earnings, but RC spouses earn about twice the amount earned by AC spouses.

The moderate gap in household earnings between those with and without casualties before deployment increases dramatically after deployment. In the ACs, the annual earnings of households without injuries are, on average, ten times those of households with deaths; in the RCs, they are about 7.2 times. After deployment, spousal earnings account for about 17 percent of household earnings for uninjured AC members and about 26 percent for uninjured RC members. In households with fatalities, after the first post-deployment year (when some households may be receiving delayed compensation on behalf of the service member), all household earnings are from the spouse (our income measure is based on service members and spouses and does not include gifts or other contributions from other family members, such as adult children, parents, or siblings).

Our household measure also does not account for income from new spouses. We defined household units based on marriage in the year before deployment, primarily to avoid concerns about endogeneity in changes in marital status, but also because of data-quality concerns regarding the exact timing of changes in marital status (especially for events that would lead to a termination of benefits) in the DEERS system. To the extent that surviving spouses remarry and their new spouses have positive earnings, our omission will result in overstating the financial harm to surviving family members from combat deaths.<sup>10</sup>

<sup>10</sup> Although the data from the Survivor Benefit Plan provide some information on remarriage, this information is indirect and incomplete. Of the 627 cases of suspended benefits we observe in January 2012 (which is 5 to 8.5 years after the death dates), only 56 list remarriage (coded as NAM in the data) as the reason.

## Survivor Benefits

Surviving spouses and children are potentially eligible to receive various forms of compensation from three primary sources: DoD, the VA, and SSA. Recurring monthly payments are made through the following programs:

- Survivor Benefit Plan (SBP)
- Special Survivor Indemnity Allowance (SSIA)
- Dependency and Indemnity Compensation (DIC)
- SSA Survivor Benefits.

The payments can take the form of annuities that are paid out as long as the surviving spouse or children maintain eligibility (SBP, SSIA, DIC). They also include some transition payments for the initial year or two following the service member's death (DIC and SSA). In addition, surviving spouses or children can receive lump-sum payments from the following:

- Servicemembers' Group Life Insurance (SGLI)
- Death Gratuity
- Combat Death Tax Forgiveness.

The key features of these programs are described below, along with our data sources and methods of computing benefits for surviving-spouse households.

Table 2.3 summarizes these payments for our samples of households with AC and RC combat deaths. The first two columns show the percentages of these households receiving each of these benefits. The next two columns report average payment amounts, in constant 2010 dollars and adjusting for tax advantages when applicable, for the subsample of households that received each type of benefit.

### Survivor Benefit Plan

The SBP program, administered by DoD, provides monthly payments to eligible spouses, former spouses, and children of deceased service members. Enrollment in the plan is provided at no cost to service members while they are in active service. Upon retirement, they can elect to cover their spouses only, their spouses and children (in which case children receive payments if the spouse dies or loses eligibility through remarriage), or their children only. Spouses and former spouses are eligible for SBP payments until their death or remarriage (before age 55).<sup>11</sup> Children can receive payments as long as they are unmarried and under the age of 18, or 22 if they are enrolled in school. Children who become disabled before losing eligibility and are unable to support themselves can receive benefits for life. The base amount of the payment for a member who dies while serving on active duty is equal to 55 percent of what his or her retirement pay would have been had he or she been retired as totally disabled, but it cannot exceed 75 percent of the member's high 36 months (for those who entered military service after September 7, 1980). The amount does not vary with the number of beneficiaries; if multiple children are designated as beneficiaries, each receives an equal share of the total amount. Payments made to spouses are reduced by payments from the VA's DIC program, but child-only SBP benefits are not affected by DIC. SBP payments are taxed as regular income.

<sup>11</sup> Surviving spouses whose remarriage ends in divorce or widowhood can have their SBP benefits reinstated.

**Table 2.3**  
**Benefits Paid to Surviving Spouses and Children**

Benefit	Percentage Receiving Benefits		Mean if Receiving Benefits (constant 2010 dollars)	
	AC	RC	AC	RC
SBP				
Year 1	71.91	73.45	12,485	13,676
Year 2	71.46	71.72	12,510	13,829
Year 3	70.79	70.69	12,589	13,977
Year 4	69.78	70.34	12,895	14,024
DIC				
Year 1	100.00	100.00	28,390	27,872
Year 2	100.00	100.00	23,457	23,652
Year 3	100.00	100.00	23,451	23,197
Year 4	100.00	100.00	23,796	23,630
SSIA				
Year 1	0.00	0.00		
Year 2	4.16	3.45	152	152
Year 3	9.44	10.34	350	298
Year 4	14.27	15.52	490	499
Social Security benefits				
Year 1	68.09	69.31	33,439	39,123
Year 2	67.98	68.97	27,896	32,906
Year 3	67.64	68.97	27,716	31,771
Year 4	67.08	68.62	27,887	31,208
Lump-sum payments with tax advantage				
SGLI	100.00	100.00	655,976	660,340
Death Gratuity	100.00	100.00	163,994	165,085
TSGLI	1.08	1.72	129,125	160,091
Combat Zone Tax Forgiveness	45.96	64.14	2,196	3,288
Lump-sum payments without tax advantage				
SGLI	100.00	100.00	436,453	437,864
Death Gratuity	100.00	100.00	109,113	109,466
TSGLI	1.08	1.72	92,307	105,768

We obtained data from the military on the current (as of January 2012) amounts paid to each beneficiary associated with a service member in our sample who died, as well as the amount of the DIC offset (if any). This allowed us to determine the base amount for that service member for 2011. Using the historical cost-of-living adjustments applied to the SBP program, we were able to compute base amounts for past years as well. We assigned payments to

all service member households currently receiving SBP payments, starting from the day after the death date (prorated for the first month and full months afterward).

Some households were not receiving payments in January 2012 because of loss of eligibility (through remarriage for spouses, age or marriage for children) but may have received them in the past. We attempted to collect information on the amount of past SBP payments to those households.

Information on the amount of SBP benefits to which a person would be entitled if currently eligible was generally available (this information is routinely maintained after loss of eligibility, because eligibility can be restored, for example, by ending a marriage or enrolling in school). For surviving spouses who were no longer receiving benefits due to remarriage, we assigned payments from the death date until the remarriage date, which we inferred from the date the current pay status started. For households in which the last child was no longer eligible to collect SBP as a dependent (because of age or marriage), we similarly used information on the past amount and the date of the most recent status change. Unfortunately, we were not able to access historical payments or base amounts for accounts that had been closed for more than 18 months. Thus, for 327 surviving-spouse households (250 AC households and 77 RC), 28 percent of the sample, we have no record of any SBP payments, although some households may have received some compensation. This limitation means that we may understate the value of this benefit to surviving spouses and children.

### **Dependency and Indemnity Compensation**

DIC payments are provided monthly to eligible survivors of veterans whose deaths are determined to be service-connected. The program is administered by the VA, and the amount paid depends on the number of children and the time since the service member's death. Spouse DIC payments are made for the life of the spouse, provided she or he does not remarry before age 57 (payments can be reinstated if a marriage ends). Children are eligible for payments until they turn 18 years of age. DIC pays an additional transitional monthly benefit for up to two years if there are surviving children under the age of 18. The amount of the transition benefit depends on the death date (which affects duration of payment), the time since the death (the maximum duration is 24 months), and the age of the youngest child (transition payments stop on the first month after the month in which the child reaches age 18). DIC paid to spouses offsets SBP payments (the DIC offset), and DIC payments are not taxed.

We computed the DIC payments in each month following the service member's death, using the historical payment rules (generally updated each December) that specify the amounts paid to surviving spouses and the amounts paid for each child under the age of 18. We used data from the DEERS system to determine the number of children and their ages. This information should be fairly complete, but it is possible that children born after the service member's death are not included in the data, which would cause us to understate the benefit. Also, the lack of reliable data on remarriages means that payments to spouses who remarried within the first four years may be overstated.

### **Special Survivor Indemnity Allowance**

Since October 2008, SSIA has been paid to surviving spouses whose SBP payments were offset by DIC. Maximum monthly payment amounts are fixed for each year, starting at \$50 in fiscal year 2009, with scheduled increases until 2017, when they will reach \$317. The actual amount

is the lesser of the amount of the DIC offset and the maximum amount. SSIA payments are taxed as regular income.

We computed the SSIA amount paid in each month to spouses by comparing the amount of the DIC offset with the maximum SSIA amount for that month and assigning the smaller value. We obtained data on current DIC offset amounts, and we computed historical DIC offsets using the method to compute spouse DIC payments described below. Child DIC payments are not offset and are not counted toward SSIA. Because the latest deaths in our sample occurred in 2006, there were no SSIA payments in the first calendar year after any death (see Table 2.3), and households in our sample experiencing combat deaths in 2003 did not receive SSIA in the first four post-deployment years due to the relatively recent establishment of the program.

### **Social Security Survivor Benefits**

Monthly Social Security payments may be paid to some surviving spouses. The amount paid is determined by SSA on the basis of the earnings history of the deceased service member. Spouses of any age who are caring for children of the service member who are under the age of 16 or disabled can receive 75 percent of the deceased worker's basic Social Security retirement amount. Monthly payments of 75 percent of that amount are also made to children under the age of 18 (19 if they are full-time students) or to children of any age who were disabled before the age of 18. Surviving spouses, including those who are not caring for young children of the deceased, can receive partial benefits starting at age 50 if they are disabled or at age 60 otherwise, or full benefits at starting at their full retirement age. An additional lump-sum benefit (of up to \$255) is paid by SSA to the surviving spouse who was living with the service member at the time of death (notwithstanding any temporary absence due to military assignment) or surviving children. These payments are partially taxed. There is also an earnings offset for surviving spouses who have not reached full retirement age; the amount of the survivor benefit is reduced by \$1 for every \$2 of spousal earnings above a preset threshold, which was \$14,640 in 2012.<sup>12</sup>

Our data source for SSA survivor benefits was SSA's Master Beneficiary Record file, which records payments from all Social Security trust fund accounts to all beneficiaries. We constructed a measure of annual SSA benefits paid to each of our service member households by summing payments made to the service member or his or her spouse on any Social Security account and payments made to any person (such as a child under the age of 18 or an adult disabled child) on behalf of the service member's or spouse's Social Security account. We removed duplicate payments and did not distinguish between different types of payment from the Social Security trust fund (retirement, disability, and survivorship).

We used the monthly benefit paid (MBP) amount on the Master Beneficiary Record to compute annual SSA survivor benefits. The MBP is the amount for which the beneficiary was eligible in a given month (we exclude monthly benefits for which the beneficiary is listed as ineligible). The MBP is not necessarily the actual amount paid in that month; the amounts are retroactively updated to reflect the correct payment eligibility after changes in status. In cases where there was a delay between the initial application and the determination that the beneficiary qualified for survivor benefits, the actual payments may have started later than our

<sup>12</sup> Surviving spouses who have their survivor benefits reduced or suspended because of their labor market earnings may be eligible for increased benefits from SSA when they reach full retirement age.

data indicate (and may have been increased temporarily to compensate for the delay). The total payment amounts in the data should be correct, however, because our data are from June 2011, which is more than five years after the combat-death dates. Table 2.3 shows that two-thirds of the surviving-spouse households received benefits from SSA. Among those receiving benefits, the average annual amount in years 2 through 4 was about \$30,000.

### **Death Gratuity**

The surviving spouses of the service members in our sample all qualified for the one-time Death Gratuity payment from DoD. The amount of this payment was increased from \$12,000 to \$100,000 in May 2005. At the same time, DoD was instructed to make an additional payment of \$88,000 to beneficiaries of service members who died between October 7, 2001, and May 11, 2005, meaning that all households in our sample received \$100,000. We assign all Death Gratuity payments in the year after the service member's death. This benefit is not taxed.

### **Servicemembers' Group Life Insurance**

AC and RC members are eligible to purchase life insurance through the SGLI program administered by the VA. The default enrollment is for the maximum amount (currently \$400,000), though members may elect to reduce the coverage (in increments of \$50,000) or cancel it. Service members must opt out of SGLI, so the vast majority participate in it. Beneficiaries can receive payments in a lump sum or in equal payments over 36 months. For deaths that occurred between October 7, 2001, and September 1, 2005, the initial SGLI amount was \$250,000, but this was increased to the full \$400,000 in 2005 when DoD made an additional Death Gratuity payment of \$150,000. Service members who served in the theater of operations for OEF/OIF were reimbursed for their SGLI premiums, so we assume that their surviving spouses all received the maximum amount in the first year after the death.

All service members enrolled in SGLI are also automatically enrolled in Traumatic Injury Protection under Servicemembers' Group Life Insurance (TSGLI), which insures service members against the occurrence of specific traumatic injuries such as amputation, paralysis, burns, loss of sight, loss of hearing, injuries requiring facial reconstruction, coma, and traumatic brain injury.<sup>13</sup> TSGLI payments range from \$25,000 to \$100,000, in \$25,000 increments, depending on the injury or combination of injuries incurred. All service members participating in SGLI were made eligible for TSGLI beginning in December 2005, and at that time, coverage was made retroactive to cover OEF/OIF injuries incurred between October 7, 2001, and November 30, 2005.<sup>14</sup> The VA provided us with a list of all service members who had received TSGLI payments through May 2011 and the dates and amounts received. As shown in Table 2.3, a very small number of the service members who later died from their injuries (14 households, or about 1 percent) also received TSGLI payments. We included these payments as part of their total compensation.

<sup>13</sup> See TSGLI Schedule of Losses (2011) for a complete list of qualifying injuries and conditions.

<sup>14</sup> Beginning in October 2011, the Veterans' Benefits Act of 2010 (PL 111-275) extended these retroactive benefits for qualifying conditions incurred during this period regardless of service member location or prior SGLI enrollment status.



### Combat-Zone Tax Forgiveness

If a service member dies while in active service in a combat zone or from injury or disease received in a combat zone, his or her income-tax liability is “forgiven” for the tax year in which the death occurred and for earlier tax years ending on or after the first day of the member’s active service in the combat zone. Forgiven tax does not have to be paid, any forgiven tax liability that has already been paid is refunded, and any tax liability existing at the date of death is forgiven.

We computed the value of the tax forgiveness by estimating the amount of federal taxes paid on the service member’s earnings in the year of death and all preceding calendar years during which the service member was deployed. We then assigned this payment as a form of untaxed compensation in the calendar year following the death year.

### Tax Advantage

Military allowances, certain military pays (e.g., those received while serving in an officially designated combat zone), VA survivor benefits, SGLI, and a portion of SSA benefits are not subject to federal income, payroll, and Social Security (i.e., Federal Insurance Contributions Act [FICA]) taxes. We computed the value of this federal tax advantage, assuming no interest or dividend income or capital gains; we further assumed that service members are married, with one dependent child.<sup>15</sup> Specifically, we determined the amount of taxed income the household would have had to receive to obtain that same amount of income after taxes. We apportioned the total value of the tax advantage to each tax-advantaged-earnings/disability-compensation category according to the category’s proportion of total earnings and compensation.

### Lump Sum Payments With and Without Tax Advantage

Income from the Death Gratuity, SGLI, and TSGLI are exempt from federal income taxes. Table 2.3 reports average payment amounts (for those receiving payments) for each of these forms of compensation, after adjusting for inflation and accounting for the tax advantage. For AC households, the amounts are \$163,994 for the Death Gratuity, \$655,976 for SGLI, and \$129,125 for TSGLI. For RC households, the amounts are \$165,085, \$660,340, and \$160,091, respectively. The Death Gratuity and SGLI amounts are substantially larger than the nominal amounts of \$100,000 and \$400,000, due in large part to the tax advantage, which is greater for lump-sum payments than for recurring payments spread over many years. Had they been taxed, these one-time payments would have increased the average tax rate paid by surviving-spouse households. If we exclude the value of the tax advantage for these one-time payments, the inflation-adjusted values are significantly lower. For the ACs, they are \$109,113, \$436,453, and \$92,307. For the RCs, they are \$109,466, \$437,864, and \$105,768.

<sup>15</sup> All service members in the sample were married in the year prior to deployment. The tax imputations do not account for state taxes or other features of the tax code such as personal exemptions, the federal earned-income tax credit, or special widow tax credits.





## Empirical Model

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To estimate the causal effect of deployment-related death on earnings and other labor market outcomes, we must form an estimate of the counterfactual labor market outcomes of service members who were killed in combat and their spouses if they had never been injured. Our estimate is the difference between the observed labor market outcomes of surviving-spouse households and their estimated counterfactual labor market outcomes. We estimated counterfactual labor market outcomes as the outcomes of similarly situated service members who were also deployed but who were uninjured (i.e., the control group).

Our main challenge stemmed from the fact that the incidence of fatalities is likely to be correlated with a wide range of characteristics of service members that determine their exposure to physical dangers during deployment—e.g., military occupation and attitudes toward risk—which may also independently affect success in the labor market. We addressed this challenge by controlling for such characteristics as completely as possible, so that they do not affect the resulting conditional correlation of fatality and labor market outcomes.

In the case of household labor market earnings, we employ an empirical model that controls for fixed characteristics of service members and spouses that are potentially correlated with both injury and earnings. Our model adjusts for initial earnings differences pre-deployment and allows for the possibility that differences in earnings growth over time are also related to observable differences in the characteristics of service members. We estimate equations of the form

$$\Delta y_{it} = \beta \text{Injury}_i + \gamma X_i + \varepsilon_i \quad (1)$$

where  $\Delta y_{it}$  represents the change in earnings experienced by the household associated with individual service member  $i$  between the year immediately prior to deployment and year  $t$  following deployment.<sup>1</sup>  $\text{Injury}_i$  is a vector of indicator variables capturing the nature of individual  $i$ 's deployment-related injuries (using the injury categories described previously and including death),  $X_i$  is a set of covariates,  $\varepsilon_i$  is an idiosyncratic error term, and  $\hat{\beta}$  measures the estimated effect of injury on earnings. Our main variable of interest is the indicator for combat death that is part of the  $\text{Injury}$  vector.

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<sup>1</sup> Because our earnings data are available on a calendar-year basis but deployments typically begin or end midyear, we use the first complete calendar year immediately prior to and following the deployment start and end dates as the pre- and post-deployment years for the purposes of earnings measurement. We include fixed effects for end month of deployment and for pre- and post-deployment calendar years to account for differences across individuals in the time between redeployment and the calendar year in which earnings are measured.

A key feature of Equation 1 is the use of earnings changes rather than earnings levels as the outcome of interest. By subtracting out earnings in the pre-deployment year, we account for pre-existing differences in earnings between those who ultimately sustain an injury and those who do not.<sup>2</sup> The potential for unobserved heterogeneity in earnings trajectories to bias estimates from Equation 1 is further mitigated by the inclusion of a wide range of controls ( $X_i$ ). A large body of research literature dating from Mincer (1974) demonstrates a relationship between demographic characteristics—work experience and education, in particular—and earnings growth. Thus, we include in  $X_i$  a range of demographic characteristics, including age and age-squared, gender, race (white, black, Hispanic), and educational attainment. Because exposure to injury and earnings potential may differ across individuals with varying job assignments, we also control for pre-deployment rank and military occupation (36 categories). To account for potential business-cycle effects and regional economic conditions, we control for deployment end date and state of residence. Finally, we have data on a range of individual-level characteristics that could be correlated with earnings growth but that are typically unavailable to researchers estimating earnings equations. These characteristics include scores on the AFQT, an achievement test designed to measure general aptitude, and several measures of pre-deployment health, including indicators for whether the service member had recently sought mental health treatment, whether he or she reported medical problems, and self-rated pre-deployment health.<sup>3</sup> The inclusion of controls capturing pre-deployment health accounts for the possibility that some of the differences in earnings growth observed between the injured and uninjured could reflect health problems that existed prior to injury. Table 2.2 presents a complete list of the control variables used in the analysis.

To properly measure the effects of injury on earnings, we must assume that after conditioning on our control variables, idiosyncratic fluctuations in earnings,  $\varepsilon_i$ , are uncorrelated with injury status. We use differenced earnings and numerous controls to account for many possible avenues through which this assumption may fail. Nevertheless, it is possible that there are unobserved factors related to injury that also affect earnings growth, in which case our estimates might overstate or understate the true causal impact of injury on earnings.

The assumption underlying the linear model is that earnings growth is, on average, constant across households, after we account for the additive effects of the covariates. An alternative approach would be to estimate a model of changes in log-earnings, which would require a different assumption about earnings growth. Here, the requirement of constant earnings growth would apply to log-earnings, which is equivalent to the assumption that earnings growth rates in proportion to earnings are the same across households, instead of absolute growth levels being the same. In the estimation of Equation 1, we prefer the specification that uses changes in earnings levels as the dependent variable, rather than changes in log-earnings,

<sup>2</sup> One concern with estimating equations such as Equation 1 is the possibility that earnings growth is also correlated with unobserved individual characteristics—for example, risk-taking attitudes—that are also correlated with injury. Heaton, Loughran, and Miller (forthcoming) provide evidence from prior years that earnings growth trends were substantially similar across injury groups in the years before deployment. This supports the assumption in the regression model that the unobserved heterogeneity is not varying over time.

<sup>3</sup> These pre-deployment health variables were obtained from the PDHA (DD Form 2795) administered by DoD to approximately 74 percent of our sample.

because it allows us to include observations with zero household income, which is particularly relevant for our population of interest.<sup>4</sup>

Household earnings effects measured using Equation 1 incorporate both the direct effect of combat death on earnings that arise from the loss of the service member's own earnings and changes in productive capabilities and any participation effects for spouses who are coping with the loss. The earnings effects for spouses may also reflect responses to the survivor-benefit compensation system. In theory, the availability of survivor benefits could affect the labor market decisions of surviving spouses by increasing their "unearned income," which, in theory, can induce individuals to consume more leisure (and, conversely, supply less labor) than they would if there were no such system in place. To the extent that these benefits are lower than the lost earnings from the service member, this channel should not lower spousal earnings relative to the uninjured (base) case. Nevertheless, our approach cannot disentangle the direct effect of combat death on productive capacity for spouses and the indirect effect from survivor compensation. This distinction is important for understanding how readily our results might generalize to other environments with different rules governing survivor payments. In particular, in environments offering survivor benefits substantially above or below current levels or with different labor market disincentives for beneficiaries, it is possible that we would observe patterns of spousal and household earnings loss that vary from those documented in this report.

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<sup>4</sup> Nevertheless, the logarithmic transformation has some attractive features; for example, it can accommodate the potentially non-normal distribution of the errors in the earnings equation arising from the fact that earnings are never negative and the distribution of earnings is right-skewed. We confirmed the robustness of our findings by also estimating the models with a log-earnings specification. The estimated effects of combat death on the change in the log of household earnings in each of the first four years after death are very large (a decline of about 2 log-points for both ACs and RCs) and highly statistically significant. Accounting for recurring survivor benefits reduces the negative estimated impact to a decline of 0.6 log-points in changes in log-income for the ACs and a decline of 0.5 log-points for the RCs (all significantly different from zero). One reason specifications in logs and levels tend to give similar results in this context is that earnings distributions tend to more closely approximate a normal distribution among the military population than among the general population.



## Results

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This chapter presents the results of estimating Equation 1 for a variety of financial outcomes in the first four years following deployment for all the service members in our sample. We begin by estimating the effect of combat death on household (service member plus spousal) labor market earnings. We then show that the predominant effect on household earnings is the loss of the service member's earnings. Finally, we show the extent to which survivor benefits from various sources offset the loss in labor market earnings through estimates of the effect of combat deaths on total household income after benefit payments.

### Impact of Combat Death on Household Labor Market Earnings

Table 4.1 presents the estimated effects of combat death on household earnings in each of the first four years after the death date. These estimates reflect the difference in earnings growth since the year prior to deployment between households experiencing combat death and those with no injury in the given year, after controlling for factors that are related to both injury propensity and earnings growth potential. Assuming that first-differencing and the inclusion of other controls adequately addresses the potential for omitted-variables bias, the estimates can be interpreted as the average difference between actual earnings of households in which a service member died and expected earnings for that same household had the service member remained uninjured. Because the labor market experiences and opportunities of AC members and RC members are fundamentally different, we estimate separate models for each.

Household earnings are defined as total military and civilian labor market earnings (as reported to SSA) of the service member and the spouse. We estimated the models separately for each year for AC and RC members. The sample includes deployments of married service members ending between June 2003 and December 2006. We exclude households with missing information (those for which we were unable to match military records with SSA data). In each year, the sample size is 224,977 AC members and 122,101 RC members, for a total of 347,087 service members.

For each component and for each of the first four years, combat death leads to sizable and statistically significant declines in household earnings. This is not surprising, of course, because of the loss of service member earnings. The amount of the household earnings loss ranges from \$63,000 to \$67,000 for the AC and from \$59,000 to \$65,000 for the RC.

These amounts are comparable to but larger than average income in the pre-deployment year for service members who died from combat injuries: \$50,405 for the ACs and \$48,138 for the RCs (see Table 2.2). This is partially explained by the fact that the service member's own

**Table 4.1**  
**Estimated Effect of Combat Death on Household Labor Market Earnings,**  
**by Component and Year**

Year After Deployment	Decrease in Annual Earnings (2010 dollars)	
	AC	RC
1	-63,244** (1,072)	-58,701** (1,775)
2	-66,648** (1,089)	-62,104** (1,811)
3	-66,566** (1,107)	-64,361** (1,879)
4	-67,297** (1,156)	-64,594** (1,949)
Observations	224,977	122,101

NOTES: Heteroskedasticity-robust standard errors are shown in parentheses. \*\* denotes statistical significance at the 1-percent level.

earnings would likely have increased after deployment, had he or she survived. This is suggested by the earnings of uninjured service members, which grew from \$53,713 in the pre-deployment year to \$66,769 in post-deployment year 4 for the AC (\$81,931 household earnings minus spousal earnings of \$15,161) and \$53,925 in the pre-deployment year to \$64,511 in post-deployment year 4 for the RC (\$86,911 household earnings minus spousal earnings of \$22,400).<sup>1</sup> Another reason for the large losses is that spousal income may have also declined. We explore this empirically in the next section.

From the perspective of military compensation policy, these estimates are valuable because they are relatively invariant to the particular set of disability policies and programs in place at a particular moment in time.<sup>2</sup> The estimates thus provide positive guidance regarding the amount of compensation needed to replace lost earnings over time for households experiencing combat deaths, unlike the normative questions of how financial compensation to surviving spouses and children should be structured and how large benefits should be relative to the service member's pre-injury earnings or the income the household would have enjoyed if he or she had not been injured.

## Impact of Combat Death on Spousal Earnings

The effect of combat death on the earnings of a surviving spouse is not obvious. On the one hand, spousal earnings may decline if the loss of the service member has psychological effects

<sup>1</sup> The level of income growth experienced by members of the control group depends on how long they remain in the military, whether or not they were deployed again (between January 2007 and December 2010), and their civilian labor market opportunities. See Heaton, Loughran, and Miller (forthcoming) for information on separation rates over the first four post-deployment years—the years on which this study focuses. Although initial estimates (for the subsample of deployments ending in 2003) suggest that the earnings effects are stable from years 4 to 7, future study will be needed to determine the long-term financial effects of combat injury and death.

<sup>2</sup> They are not completely invariant because of the incentive effects described in the previous section.

that limit the spouse's ability to participate in the labor market or if he or she faces increased time demands at home, for example, demands related to child care. To the extent that short-term compensation in the form of death benefits increases household income (an issue explored in the next section), there may also be positive income effects that lead to decreased spousal labor market attachment. Spouses receiving survivor benefits from SSA can face high effective tax rates on their earnings after they exceed a preset threshold, which could also lower their earnings. Spousal earnings may instead increase, possibly after some delay, if surviving spouses increase their labor market participation and human-capital investments in response to the income loss from their spouse. It is also possible that spousal earnings would not be affected by combat deaths, especially if spouses remarry within a few years of the death.

Table 4.2 shows estimates of the impact of combat deaths on the earnings of surviving spouses. The sample includes all spouses who were married to service members prior to their deployment and does not condition on later changes in marital status. Sample sizes are identical to those in Table 4.1: 224,977 AC members and 122,101 RC members.

Surviving spouses, on average, have lower earnings in the years after their spouses' deaths. The amount of this decline is about \$4,500 to \$5,500 for spouses of AC members and \$7,500 to \$8,500 for spouses of RC members. These amounts tend to increase between the first and second year and then remain surprisingly stable through year 4 after the death. This indicates that the psychological effects of the loss or time demands on surviving spouses may remain barriers to full labor-force participation for several years. It is also possible that the declines in earnings are related to an income-effect response to cash compensation received in the form of survivor benefits, particularly to a substitution effect from the labor market disincentive created by the reduction in survivor payments from SSA for income levels above a preset threshold.

The estimated amounts of spousal income loss are non-trivial, but they reflect only about one-tenth of the overall effect of combat death on household earnings. This confirms that the *main* source of the decline in household earnings is the loss of the service member's earnings. It is also consistent with the general pattern that spousal earnings, on average, amount to less than one-third of total household earnings.

**Table 4.2**  
**Estimated Effect of Combat Death on Spousal Labor Market Earnings,**  
**by Component and Year**

Year After Deployment	Decrease in Annual Earnings (2010 dollars)	
	AC	RC
1	-4,600** (448)	-7,673** (899)
2	-5,459** (480)	-8,527** (934)
3	-5,270** (517)	-8,841** (976)
4	-5,215** (547)	-8,329** (1,047)
Observations	224,977	122,101

NOTES: Heteroskedasticity-robust standard errors are shown in parentheses. \*\* denotes statistical significance at the 1-percent level.



## Impact of Combat Death on Household Income from All Sources

We compute the impact of combat death on total household income by including the value of financial support to surviving spouses and children provided by DoD, the VA, and SSA, as described in Chapter Two.

Table 4.3 considers net income effects after taking into account recurring but not lump-sum survivor benefits.<sup>3</sup> For both AC and RC members, one column includes labor market earnings plus all recurring payments from DoD and the VA (retirement, disability, and survivor benefits), and one column includes payments from SSA as well. Sample sizes in this table are slightly lower than those in previous tables because we now exclude households in which the service member's death was not combat-related.<sup>4</sup> In the remaining analysis, we consider 224,121 AC households and 121,864 RC households.

Recurring survivor benefits from DoD and the VA, as well as those from SSA, make a substantial contribution to the financial well-being of surviving-spouse households. After adding in all forms of recurring survivor payments, the estimated effects of combat-related death remain negative and statistically significant. However, the income losses are 70 percent smaller than the earnings losses for AC members in Table 4.1 and 78 percent smaller than the earnings losses for RC members. Hence, these recurring payments have a meaningful impact

**Table 4.3**  
**Estimated Effect of Combat Death on Household Income, by Component, Year,**  
**and Income Definition**

Year After Deployment	Decrease in Annual Household Income (2010 dollars)			
	AC		RC	
	With Recurring DoD and VA Payments	With Recurring DoD, VA, and SSA Payments	With Recurring DoD and VA Payments	With Recurring DoD, VA, and SSA Payments
1	-26,799** (970)	-4,290** (1,112)	-21,487** (1,718)	5,255* (2,115)
2	-36,045** (977)	-17,387** (1,049)	-30,136** (1,744)	-7,978** (1,966)
3	-36,939** (1,000)	-18,564** (1,071)	-33,867** (1,821)	-12,647** (2,033)
4	-38,441** (1,050)	-20,231** (1,116)	-34,738** (1,873)	-14,270** (2,069)
Observations	224,121	224,121	121,864	121,864

Notes: Heteroskedasticity-robust standard errors are shown in parentheses. \* denotes statistical significance at the 5-percent level, \*\* at the 1-percent level.

<sup>3</sup> Recurring payments include SBP, DIC, and SSIA, as well as SSA benefits. Lump-sum payments are from SGLI, TSGLI, the Death Gratuity, and Combat Zone Tax Forgiveness.

<sup>4</sup> We exclude households with non-combat-related deaths because we were not able to obtain historical information on death-benefit payments to their surviving spouses. Including these households without accounting for all of their income would introduce a positive bias in the estimates. The bias would likely be small because these individuals are only a tiny fraction of the sample, but we prefer to exclude them to ensure the validity of the estimates.

by offsetting more than two-thirds of the household earnings losses. Nevertheless, the average annual decline in household income for surviving-spouse households remains at about \$20,000 for AC spouses and \$14,000 for RC spouses in the fourth year after the death.

The preceding calculations do not account for the large lump-sum payments that typically are received by survivors in the first year following a combat fatality. A natural question is how these payments should be factored into the overall income loss experienced by survivors. One approach is to compute the number of years of the net decline in income that could be replaced by the value of the lump-sum payments. This metric is a natural one if we imagine that the surviving spouse saves the bulk of the payment in an interest-bearing account and withdraws only the amount needed each year to cover the shortfall between actual and expected income. However, while this calculation can provide a useful benchmark, it omits any changes in household expenditures related to the service member's death. Some expenses (such as those for food and clothing) will likely decline, but others (such as those for child care) may increase. For simplicity, we assume the real interest rate is zero.

For members of the ACs, the total impact of a combat death on household income over the first four years, excluding lump-sum payments, is a loss of \$60,472. The annual net income loss in year 4 was \$20,231 (in 2010 dollars), which we assume stays constant in real terms in all future years.<sup>5</sup> The average value of the lump-sum payments was \$822,865 for these households. This implies that those payments could be used to maintain household income at a level equal to what it would have been had the service member not been injured for nearly 42 years after the death.

For members of the RCs, survivor compensation is even higher relative to earnings losses. These households experienced income losses over the first four years after the service member's death of \$40,130, with a loss of \$14,270 in year 4. Their lump-sum payments amounted to \$828,085. Assuming that the annual income loss remains level at \$14,270, this implies that the lump-sum payment could be used to replace the annual income losses for more than 59 years after the service member's death.

Because of the progressive tax system, the value of the tax advantage for large lump-sum payments made in a single year can be substantially greater than the value of the tax advantage for the same total amount paid over many years. To avoid overstating the value of the lump-sum payments, we also provide a lower-bound calculation that takes the very conservative approach of omitting the value of the tax advantage for lump-sum payments entirely. In this case the value of lump-sum payments to AC spouses is \$547,572, which could be used to maintain household income for, on average, 28 years after the service member's death. For RC spouses, the lump-sum payments are worth \$551,257 (the slight difference between components is due to differences in timing of payments, TSGLI receipt, and Combat Zone Tax Forgiveness amounts), which would enable households to maintain their expected income for nearly 40 years following the service member's death.

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<sup>5</sup> These results are not particularly sensitive to the assumption of constant income loss after year 4. For example, if we allow future income for the comparison group to grow at 1.5 percent per year in real terms (about double the average annual real income growth observed in the United States between 1992 and 2006), the lump-sum payments would still last for more than 33 years for AC households and more than 44 years for RC households.

These calculations indicate that although the current lump-sum payments may not be sufficient to permanently replace the lost income resulting from combat death, they are sufficient to replace lost income for surviving spouses and children for several decades.

## Discussion

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Our estimated effects of combat death on household income demonstrate several patterns with respect to earnings loss: (1) household earnings losses following the combat death of a household member are economically large and persistent over time; (2) most (approximately 90 percent) of these losses can be attributed to the loss of the deceased service member's own earnings, with the remainder attributable to declines in spousal earnings; (3) recurrent benefits replace a substantial fraction of earnings losses, but meaningful income losses remain after taking them into account; (4) the combined value of recurrent and lump-sum benefits can fully offset household earnings losses for 20 years or more.

To what extent do these results allow us to draw conclusions about whether benefits are adequate or inadequate? Such questions are normative, and the answers depend in large part on the overarching goals and constraints associated with a particular compensation system. Heaton et al. (2012), for example, argue that the structure and amount of compensation provided to families of combat casualties should be adjusted to reflect policymaker preferences regarding the desirability of fulfilling goals such as compensating for economic loss, ensuring a stable inflow of new personnel into the military, and appropriately recognizing the sacrifice of those who died serving the country. While normative questions surrounding benefit adequacy are important, resolving them is beyond the scope of the present inquiry.

Nevertheless, our analysis does allow us to construct metrics likely to be useful to policymakers considering whether current compensation policies meet the normative and other goals of DoD, families of service members, and the public at large. Measures that capture the extent to which disability payments compensate for lost earnings, i.e., "replacement rates," use ratios of income after benefits to income available without benefits. In some cases, replacement rates are measured with reference to earnings prior to the injury or death, while in other cases, they are measured relative to contemporaneous or expected future income. Both measures are commonly used to evaluate the size and adequacy of benefits because they can be used to inform different policy questions. For example, if the primary goal of a compensation policy is to ensure that injured households are no worse off economically than they were prior to the injury, pre-injury earnings likely provide an informative denominator in the replacement rate. Alternatively, if the goal of the policy is to ensure that households experiencing injury are as well off as they would have been had no injury occurred, a replacement rate that takes into account wage growth and other dynamics of earnings is likely to be preferred. Among economists, who typically think of welfare in terms of utility rather than in monetary terms, the latter approach probably provides a more natural starting place, but there is no consensus on this issue.

Recognizing the potential usefulness of different measures, we consider two ways of constructing the replacement rate, both of which gauge financial well-being using household income. As mentioned in Chapter Four, however, the death of a service member may also affect household expenses. Therefore, income-based approaches that do not account for changes in household size will provide an incomplete picture of financial well-being. Although there is no obvious way to account for the various changes in household expenditures that may follow a combat death, an expenditure-based concept can still be useful in interpreting the pattern of income-based replacement rates. In particular, it provides some rationale for the appropriateness of higher replacement rates for households with (more) children. The proportional decrease in family size is smaller in those households, and those households are more likely to experience increased expenses related to child care.

## Household-Income Replacement Rates

We first consider replacement rates relative to expected household income in the absence of injury to measure how survivor benefits affect the financial status of the household relative to what it would have been if the service member had not been injured. We call this the “household-income replacement rate,” which we define as the ratio of total household income, including spousal earnings and survivor benefits, to predicted household income if the service member had not been injured. For example, a household in which a surviving spouse has \$10,000 in earned income and receives \$50,000 in survivor compensation would have a total annual income of \$60,000. If the household would have earned \$70,000 in that year had the service member not been injured (\$50,000 by the member and \$20,000 by the spouse), the estimated replacement rate for that household in that year would be 86 percent ( $60,000/70,000$ ). This replacement-rate measure provides an indication of how economically well off an injured household would be relative to a similar, uninjured household.

We computed expected household income for each surviving-spouse household in each post-deployment year by adding the predicted increase in household income from the regression model described in Chapter Three to actual household income in the pre-deployment year, ignoring the parameter estimates for injury. Thus, expected household income is the income our regression model predicts a service member’s household would have earned in a given post-deployment year had he or she not been injured. A decline in household income relative to expected household income results in a replacement rate of less than 100 percent; an increase in household income relative to expected household income results in a replacement rate of more than 100 percent.

Table 5.1 presents the median<sup>1</sup> household-income replacement rate across households for AC members; the top panel calculates the rates using only recurrent payments, and the bottom panel incorporates both recurrent and lump-sum payments.

<sup>1</sup> We report median values because they are less sensitive to outliers than the mean and may more accurately capture the experience of the “typical” household that experiences a fatality. Because the distribution of replacement rates is right-skewed, the median is also a more conservative measure of the central tendency. For each of the household-size groups and years that we consider, the mean replacement rate is larger than the median rate reported in the table. The mean values of the year 4 replacement rates that exclude lump-sum payments are statistically different from 100 percent at the 95-percent confidence level for both the AC and RC households. The 95-percent confidence intervals for the mean replacement rates that include lump-sum payments are larger than 100 percent for both the AC and RC households.

**Table 5.1**  
**Median Household-Income Replacement Rates: Active Components**

	Year 1	Year 2	Year 3	Year 4
No Lump-Sum Payments				
All deaths	0.87	0.81	0.79	0.78
By number of children				
0	0.51	0.49	0.49	0.49
1	0.90	0.82	0.81	0.77
2	1.01	0.93	0.92	0.89
3+	1.11	1.01	0.99	0.96
Lump-Sum Payments Amortized over 20 Years (Without Tax Advantage)				
All deaths	1.29	1.19	1.19	1.16
By number of children				
0	1.05	0.98	0.96	0.93
1	1.32	1.21	1.22	1.16
2	1.39	1.30	1.28	1.24
3+	1.49	1.37	1.33	1.29
Lump-Sum Payments Amortized over 20 Years (With Tax Advantage)				
All deaths	1.42	1.29	1.28	1.24
By number of children				
0	1.17	1.08	1.04	1.00
1	1.46	1.31	1.31	1.25
2	1.54	1.41	1.37	1.32
3+	1.62	1.48	1.43	1.39

The median household-income replacement rate for AC households decreases from 87 percent to 78 percent over the first four years after the service member's death. The decline is likely due to the termination of some transition benefits (from the VA and SSA), as well as the increasing likelihood that dependent children have become adults or that the surviving spouse has remarried (household size in our calculations is based on the year before the service member's deployment). Consistent with the fact that some benefits are available only for households with dependent children, the replacement rates are lowest for households with no children and tend to increase with family size. These patterns are also present for members of the RCs, whose median replacement rates are presented in Table 5.2. Not accounting for lump-sum payments, median replacement rates in the RCs decline from 105 percent to 88 percent over the first four years after the service member's death. The finding that replacement rates for both AC and RC households tend to be below 100 percent when only recurring payments are considered is consistent with the regression-model estimates in Table 4.3, which show a negative average impact of combat death on household income after recurring payments from DoD, the VA, and SSA are included.<sup>2</sup>

<sup>2</sup> Because the function is non-linear and replacement rates vary across individuals, there is no reason to expect that the average replacement rate would equal the ratio of average survivor benefits to average expected household income.

**Table 5.2**  
**Median Household-Income Replacement Rates: Reserve Components**

	Year 1	Year 2	Year 3	Year 4
<b>No Lump-Sum Payments</b>				
All deaths	1.05	0.97	0.91	0.88
By number of children				
0	0.75	0.69	0.63	0.62
1	0.94	0.84	0.77	0.76
2	1.15	1.04	0.99	0.93
3+	1.30	1.20	1.11	1.12
<b>Lump-Sum Payments Amortized over 20 Years (Without Tax Advantage)</b>				
All deaths	1.49	1.33	1.29	1.22
By number of children				
0	1.15	1.12	1.03	1.06
1	1.43	1.29	1.18	1.15
2	1.51	1.33	1.31	1.27
3+	1.80	1.60	1.50	1.46
<b>Lump-Sum Payments Amortized over 20 Years (With Tax Advantage)</b>				
All deaths	1.63	1.45	1.38	1.31
By number of children				
0	1.27	1.21	1.10	1.13
1	1.56	1.40	1.28	1.24
2	1.63	1.42	1.38	1.34
3+	1.97	1.73	1.62	1.55

In incorporating the lump-sum payments into our replacement-rate calculations, we must make a judgment as to how spread these payments across different years. Rather than assign them all to the first year, we include 5 percent of the value in each year. Assuming real interest rates of about zero, this is the annual amount the household would have available in each year if it spread the lump-sum amount over 20 years after the service member's death. The choice of 20 years is somewhat arbitrary, but it is meant as an upper bound on the time it would take for a new child, born in the year after the service member's death, to reach adulthood.<sup>3</sup>

After accounting for lump-sum payments, we find overall replacement rates for both the ACs (Table 5.1) and the RCs (Table 5.2) that are above 100 percent for a 20-year horizon, even when we omit the value of the tax advantage for the lump-sum payments.<sup>4</sup> Replacement rates are even higher when we add the value of the tax advantage on the portion of the lump-sum payment attributed to each post-deployment year (1/20). This is consistent with the finding in

<sup>3</sup> Amortizing over a shorter horizon would increase the annual value of the lump-sum payments and hence increase the replacement rate. Using a longer horizon would decrease the replacement rate.

<sup>4</sup> The exception is for AC households with no dependent children two or more years after the service member's death. Median replacement rates remain over 90 percent.



Chapter Four that lump-sum income, whether allowing for the tax advantage or not, could replace lost earnings for more than two decades.

The fact that estimated household-income replacement rates are substantially greater than 100 percent may raise questions about the appropriateness of current levels of survivor compensation for these families. However, there are economic arguments for providing replacement rates above 100 percent. First, a large body of evidence suggests that individuals typically enjoy real wage gains as they grow older, particularly early on in their careers. Survivor payments typically do not increase over time in real terms, meaning that the relative value of these benefits is likely to erode, and indeed the patterns in Tables 4.3, 5.1, and 5.2 suggest such erosion. Taking a life-cycle perspective, it may be logical to provide benefits above full replacement initially to account for the fact that those killed in combat will not enjoy the earnings growth expected by their uninjured peers. Economic theory also suggests that replacement rates above 100 percent can be justified for occupations in which calculated risk-taking is desirable—e.g., policing, firefighting, military service (Seabury, 2002)—a perspective that might also rationalize higher payments for military surviving households than civilian surviving households. It is common for states and municipalities to provide police and firefighters with special payments in the event of disability or death above and beyond what would be given to the general public, leading to higher than typical replacement rates (LaTourrette, Loughran, and Seabury, 2008). Moreover, replacement rates above 100 percent might also partly compensate families for non-pecuniary losses, such as lost companionship of a loved one. Payments for such non-pecuniary losses are common in other compensation contexts involving injury and death.

### Replacement Rates Relative to Pre-Deployment Member Earnings

As an alternative replacement-rate measure, we consider replacement rates defined relative to the service member's own earnings in the pre-deployment year. We call this the "own-earnings replacement rate." This measure focuses on the flows of income into the household attributable to the service member and allows us to assess whether households experiencing a combat death are as economically well off following receipt of benefits as they were prior to the loss of life. The top panels of Tables 5.3 and 5.4 show that median<sup>5</sup> own-earnings replacement rates tend to be below 100 percent when we consider only recurring payments.

The bottom two panels of Tables 5.3 and 5.4 show own-earnings replacement rates that account for the value of lump-sum payments. Excluding the value of the tax advantage, median replacement rates over years 1 through 4 are roughly 170 percent for AC households and 190 percent for RC households. Including the tax advantage increases the median rates to about 185 percent for AC households and 200 percent for RC households. Replacement rates generally increase with the number of children. Across all family sizes, years, and components,

<sup>5</sup> For this definition of the replacement rate, the mean replacement rate is especially likely to be influenced by outlier observations, resulting in unusually high replacement rates in cases where the service member had very low pre-deployment income. The mean own-earnings replacement rates corresponding to the family-size groups and years after deployment in Tables 5.3 and 5.4 are in all cases larger than the median rates reported in the tables. As expected, the difference between mean and median rates is larger under the own-income replacement rate than under the household-income replacement rate. The mean year 4 replacement rates that exclude lump-sum payments are not statistically different from 100 percent at the 95-percent confidence level for either the AC or RC. At the 95-percent confident level, the mean replacement rates that include lump-sum payments are statistically different from 100 percent, but not statistically different from 200 percent.



**Table 5.3**  
**Median Own-Earnings Replacement Rates Relative to Pre-Deployment**  
**Service Member Earnings: Active Components**

	Year 1	Year 2	Year 3	Year 4
No Lump-Sum Payments				
All deaths	0.68	0.67	0.66	0.68
By number of children				
0	0.56	0.55	0.57	0.57
1	0.72	0.68	0.67	0.67
2	0.71	0.71	0.68	0.69
3+	0.80	0.76	0.75	0.78
Lump-Sum Payments Amortized over 20 Years (Without Tax Advantage)				
All deaths	1.74	1.70	1.70	1.70
By number of children				
0	1.41	1.40	1.40	1.40
1	1.88	1.78	1.75	1.76
2	1.84	1.82	1.83	1.83
3+	1.89	1.84	1.83	1.83
Lump-Sum Payments Amortized over 20 Years (With Tax Advantage)				
All deaths	1.93	1.87	1.85	1.83
By number of children				
0	1.59	1.56	1.53	1.53
1	2.07	1.95	1.89	1.91
2	2.02	1.97	1.97	1.95
3+	2.08	1.98	1.99	1.96

replacement rates after accounting for the lump-sum payments are greater than 140 percent relative to the service member's own pre-deployment earnings.

The median own-earnings replacement rates tend to be smaller than the household-income replacement rates (though not for all subgroups) when the lump-sum payments are not considered. This may seem surprising at first, because the base (the denominator in the fraction) is larger in Tables 5.1 and 5.2, where it includes both spousal earnings and income growth over time. This decreases the replacement rate compared with the rates in Tables 5.3 and 5.4. However, the household-income measure also includes spousal income in the numerator, which increases the replacement rate, because the decline in spousal earnings after the fatality is much smaller than decline resulting from the total elimination of the service member's own earnings.

One virtue of basing the replacement rate on the service member's pre-deployment earnings is that it allows for a rough comparison between compensation provided to survivors of combat death and compensation provided in some other contexts. For example, family members of civilian DoD employees who die while performing their official duties are compensated

**Table 5.4**  
**Median Own-Earnings Replacement Rates Relative to Pre-Deployment**  
**Service Member Earnings: Reserve Components**

	Year 1	Year 2	Year 3	Year 4
No Lump-Sum Payments				
All deaths	0.74	0.72	0.71	0.72
By number of children				
0	0.75	0.75	0.72	0.68
1	0.75	0.71	0.72	0.74
2	0.70	0.68	0.68	0.68
3+	0.78	0.78	0.76	0.74
Lump-Sum Payments Amortized over 20 Years (Without Tax Advantage)				
All deaths	1.96	1.90	1.86	1.84
By number of children				
0	1.69	1.65	1.65	1.65
1	1.97	1.92	1.88	1.91
2	1.93	1.82	1.79	1.80
3+	2.12	2.03	1.99	2.02
Lump-Sum Payments Amortized over 20 Years (With Tax Advantage)				
All deaths	2.17	2.07	2.03	1.97
By number of children				
0	1.91	1.84	1.84	1.87
1	2.19	2.12	2.05	2.03
2	2.12	1.98	1.94	1.94
3+	2.33	2.21	2.17	2.17

based on the provisions of the Federal Employee Compensation Act (FECA), using a formula based on prior earnings. Under FECA, spouses of deceased civilian federal employees are entitled to recurring payments of 50 percent of base pay if they have no children, 60 percent if they have one child, and 75 percent if they have two or more children. Civilian federal employees also receive a lump-sum insurance payment similar to the SGLI payment through the Federal Employees Group Life Insurance (FEGLI) program; the default FEGLI amount is approximately equal to the decedent's annual pay plus \$2,000.<sup>6</sup>

One natural comparison here is between the median own-earnings annual replacement rate for military survivors based on the military compensation system and that of civilian DoD survivors provided by the civilian compensation system.<sup>7</sup> When we consider recurring

<sup>6</sup> Reservists who also have civilian federal jobs and are activated and killed in combat may also be eligible for some components of FEGLI, but we ignore that possibility in our calculations.

<sup>7</sup> Although we incorporate data on military compensation received over all four of the first four post-deployment years in these measures, at a conceptual level, these particular replacement rates can be thought of as static over time, since neither the pre-injury earnings nor the absolute amount of the benefit would change under normal circumstances unless there was

payments in year 4 only (the last column of the top panel of Tables 5.3 and Table 5.4), we see that the military compensation system provides a higher replacement rate for both AC and RC households except in the case of families with two children, for whom replacement rates are a few percentage points below those in the civilian sector. After taking into account lump-sum payments amortized over 20 years (the middle panels of Tables 5.3 and 5.4),<sup>8</sup> we see that replacement rates for surviving families of combat casualties are substantially above those for civilian families. This difference can be traced to the higher basic coverage levels provided by SGLI (\$400,000) than FEGLI (annual earnings plus \$2,000). If policymakers believe current compensation levels for survivors of civilian employees are adequate, the fact that replacement rates for military families are substantially higher for both the ACs and the RCs suggests that military survivor compensation may also be viewed as adequate.

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a change in the number of dependent children (through marriage or age) or the surviving spouse remarried. In our military sample, at least 627 cases of SBP benefits were terminated for surviving spouses or children because of loss of eligibility. Because we define family size for military households based on the pre-deployment year, our comparison favors the civilian system (where we consider payments for a household that maintains full eligibility).

<sup>8</sup> We do not take into account the tax-advantaged nature of the lump-sum payments for this comparison. Under both systems, the lump-sum insurance payments are tax-advantaged, but the value of the tax advantage under the civilian system will depend on the (unknown) exact earnings of the surviving spouse. Including the tax advantage would increase the disparity between the military and civilian replacement rates because the lump-sum payments are substantially larger for military combat fatalities. Another complication in making the comparison arises from the fact that we do not have data on SSA payments to civilian DoD survivors. Hence, the median replacement rates for military fatalities all remain above 100 percent even if we exclude all SSA payments.

## Conclusions

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The empirical model developed in this study measures the financial impact of combat deaths in Iraq and Afghanistan on surviving spouses and children over the first four years following the death. We used information on earnings trajectories for uninjured service members (and their spouses) who were deployed to Iraq or Afghanistan at the same time as those who were killed to estimate counterfactual earnings for what the households with combat fatalities would have earned if the service members had not been injured. The key advantage of our modeling approach is the use of differenced outcome measures, which account for unobserved heterogeneity across individuals who ultimately suffer injury and those who do not. We further control for a wide range of demographic characteristics in our analysis.

We find substantial household earnings losses following the deaths of service members, and the losses increase over the first four years following the deaths. For AC households, the losses increase from \$63,000 to \$67,000 between years 1 and 4. The losses increase from \$59,000 to \$65,000 for RC households. Among both types of households, the greater part of the labor market earnings losses are the loss in service member earnings, but we also observe statistically significant and practically important declines in the earnings of the spouses of fallen service members.

Payments come from a variety of sources, including DoD, the VA, and SSA, and they consist of both recurrent and lump-sum payments. Our discussion and analysis of survivor payments demonstrates that while recurrent payments alone are insufficient to fully compensate households for earnings losses following the death of a service member, lump-sum payments from SGLI and the Death Gratuity, when combined with recurrent payments, are sufficient to fully replace lost earnings for several decades.

There are many possible benchmarks one might consider in assessing the magnitude or adequacy of compensation. We discuss two such benchmarks—one based on replacement of expected future earnings and one based on replacement of pre-injury earnings—and use them to calculate replacement rates for our sample. Under both approaches, replacement rates are generally less than 100 percent (although above two-thirds) when we consider recurrent payments only, and they are well above 100 percent when amortized lump-sum payments are included. We also find that military survivor benefits are generally higher than benefits for survivors in the civilian federal system.



## References

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- Angrist, Joshua D., "Lifetime Earnings and the Vietnam Era Draft Lottery: Evidence from Social Security Administrative Records," *The American Economic Review*, Vol. 80, No. 1, 1990, pp. 313–335.
- , "Estimating the Labor Market Impact of Voluntary Military Service Using Social Security Data on Military Applicants," *Econometrica*, Vol. 66, No. 2, 1998, pp. 249–288.
- Christensen, Eric, Joyce McMahon, Elizabeth Schaefer, Ted Jaditz, and Dan Harris, *Final Report for the Veterans' Disability Benefits Commission: Compensation, Survey Results, and Selected Topics*, Alexandria, Va.: Center for Naval Analyses, 2007.
- Defense Casualty Analysis System (DCAS), website, undated. As of June 8, 2012:  
<https://www.dmdc.osd.mil/dcas/pages/main.xhtml>
- EconSys, *A Study of Compensation Payments for Service-Connected Disabilities*, Falls Church, Va.: EconSys, 2008.
- Heaton, Paul, James N. Dertouzos, James M. Anderson, and John Mendeloff, *Compensation for Combat Deaths: Policy Considerations*, Santa Monica, Calif.: RAND Corporation, DB-633-OSD, 2012. As of June 11, 2012:  
[http://www.rand.org/pubs/documented\\_briefings/DB633.html](http://www.rand.org/pubs/documented_briefings/DB633.html)
- Heaton, Paul, David S. Loughran, and Amalia R. Miller, *Compensating Wounded Warriors: An Analysis of Injury, Labor Market Earnings, and Disability Compensation Among Veterans of the Iraq and Afghanistan Wars*, Santa Monica, Calif.: RAND Corporation, MG-1166-OSD, forthcoming.
- Karney, Benjamin R., and John S. Crown, *Families Under Stress: An Assessment of Data, Theory, and Research on Marriage and Divorce in the Military*, Santa Monica, Calif.: RAND Corporation, MG-599-OSD, 2007. As of June 11, 2012:  
<http://www.rand.org/pubs/monographs/MG599.html>
- LaTourrette, Tom, David S. Loughran, and Seth A. Seabury, *Occupational Safety and Health for Public Employees: Assessing the Evidence and the Implications for Public Policy*, Santa Monica, Calif.: RAND Corporation, MG-792-CHSWC/NIOSH, 2008. As of June 11, 2012:  
<http://www.rand.org/pubs/monographs/MG792.html>
- Loughran, David S., Jacob Alex Klerman, and Craig Martin, *Activation and the Earnings of Reservists*, Santa Monica, Calif.: RAND Corporation, MG-474-OSD, 2006. As of June 11, 2012:  
<http://www.rand.org/pubs/monographs/MG474.html>
- Loughran, David S., Paco Martorell, Trey Miller, and Jacob Alex Klerman, *The Effect of Military Enlistment on Earnings and Education*, Santa Monica, Calif.: RAND Corporation, TR-995-A, 2011. As of June 11, 2012:  
[http://www.rand.org/pubs/technical\\_reports/TR995.html](http://www.rand.org/pubs/technical_reports/TR995.html)
- Mincer, Jacob A., *Schooling, Experience, and Earnings*, New York: Columbia University Press, 1974.
- Obama, Barack, "Presidential Memorandum—Eleventh Quadrennial Review of Military Compensation," Washington, D.C.: White House Press Office, 2009.
- Seabury, Seth A., *Public Safety v. Private Risk: Optimal Injury Compensation for Law Enforcement Officers*, dissertation, New York: Columbia University, Department of Economics, 2002.

Social Security Online, Code of Federal Regulations, Part 404—Federal Old-Age, Survivors and Disability Insurance (1950—), 2011. As of June 8, 2012:  
[http://www.ssa.gov/OP\\_Home/cfr20/404/404-0000.htm](http://www.ssa.gov/OP_Home/cfr20/404/404-0000.htm)

TSGLI Schedule of Losses, website, 2011. As of June 8, 2012:  
<http://www.insurance.va.gov/sglisite/tsgli/Schedule/Schedule.htm>

U.S. Department of Defense, DoD MCM-0006-02, “Updated Procedures for Deployment Health Surveillance and Readiness,” Office of the Chairman, The Joint Chiefs of Staff, 2002. As of June 18, 2012:  
[http://www.med.navy.mil/sites/nmcscd/nepmu6/Documents/ThreatAssessment-reference/mcm6\\_02\[1\]%20Deployment%20Policy.pdf](http://www.med.navy.mil/sites/nmcscd/nepmu6/Documents/ThreatAssessment-reference/mcm6_02[1]%20Deployment%20Policy.pdf)